Section 1 – 2: Operations on Signed Numbers

Multiplication and Division Introduction

Unlike addition and subtraction problems where the signs of the numbers tell you what to do, multiplication and division problems are shown by the use of **specific symbols.**

How you know when to Multiply

A pair of Parentheses ( ) is the symbol used to show multiplication

A number directly outside a parentheses and a number inside the parentheses
means to multiply the two numbers together.

5(2) means 5 times 2 –6(4) means –6 times 4

Two numbers in parentheses next to each other
also means to multiply the two numbers together.

(–4)(3) means –4 times 3 (–2)(–6) means –2 times –6

A negative sign in front of a parentheses
means to multiply the number inside the parentheses by –1

–(7) means –1 times 7 –(3) means –1 times 3 –(–6) means –1 times –6

How you know when to Divide

A fraction bar $\frac{4}{2}$ is the symbol used to show division.

The fraction bar means to divide the numerator by the denominator.

$\frac{4}{2}$ means 4 divided by 2 $\frac{-10}{5}$ means –10 divided by 5 $\frac{-6}{-3}$ means –6 divided by –3

Rules for the Multiplication and Division of Two Signed Numbers

1. **The symbol tells you if you should multiply or divide.** A **pair of parentheses** ( ) is the symbol used to show multiplication. A **fraction bar** like $\frac{4}{2}$ is the symbol used to show division.

2. **The signs of the two numbers determines if the answer is positive or negative**.

When Multiplying or Dividing

If the **signs of the two numbers are the same**, both + or both –, the answer is **positive +**

If the **signs of the two numbers are different**, one + and one –, the answer is **negative –**

Example 1

$2(-3)$
means 2 times -3
the signs are different
the answer is negitive
$2(-3) = -6$

Example 2

$-2(4)$
means -2 times 4
the signs are different
the answer is negitive
$-2(4) = -8$

Example 3

$(-2)(-5)$
means -2 times -5
the signs are the same
the answer is positive
$(-2)(-5) = 10$

Example 4

$-(-5)$
means -1 times -5
the signs are the same
the answer is positive
$-(-5) = 5$

Example 5

$-(4)$
means -1 times 4
the signs are different
the answer is negitive
$-(4) = -4$

Example 6

$\frac{-10}{2}$
means -10 divided by 2
the signs are different
the answer is negitive
$\frac{-10}{2} = -5$

Example 7

$\frac{12}{-4}$
means 12 divided by -4
the signs are different
the answer is negitive
$\frac{12}{-4} = -3$

Example 8

$\frac{-15}{-5}$
means -15 divided by -5
the signs are the same
the answer is positive
$\frac{-15}{-5} = 3$

Example 9

$\frac{-3}{-3}$
means -3 divided by -3
the signs are the same
the answer is positive
$\frac{-3}{-3} = 1$

Rules for the Addition or Subtraction of Two Signed Numbers

How you know when to ADD or SUBTRACT two numbers.

You have an addition or subtraction problem when you have 2 or more numbers separated with + or – signs. **Addition and subtraction problems do not have brackets around the numbers involved.**

5 – 3 or **– 4 + 5** or **– 4 – 6** or **– 5 – 2**

Note: + or – signs are never right next to each other like 5 + – 6.

The + sign or the – sign does not determine addition or subtraction.

The type of **signs the two numbers have** tells you if you should add or subtract the two numbers.

Rule for the Addition of Two Signed Numbers

If two numbers have the **same signs**, both + or both –
you **add** the two numbers
and the answer has the **sign that was common** to both numbers.

Examples for addition: The signs of the two numbers **are the same**, both + or both –

$-3-9=-12$ add 3 and 9 to get 12 and give the answer the common – sign to get –12

$5+6=11$ add 5 and 6 to get 11 and give the answer the common + sign to get +11

$-5-8=-13$ add 5 and 8 to get 13 and give the answer the common – sign to get –13

Rule for the Subtraction of Two Signed Numbers

If two numbers have **different signs**, one + and one –
you **subtract** the smallest of the two numbers from the largest without using their signs
and **the answer has the sign of the number farthest from zero.**

Examples for subtraction: The signs of the two numbers **are different**, one + and one –

$3-9=-6$ subtract 9 and 3 to get 6 and give the answer a negative sign to get –6

$-2+6=4$ subtract 6 and 2 to get 4 and give the answer a positive sign to get +4

$12-9=3$ subtract 12 and 9 to get 3 and give the answer a positive sign to get +3

$-10+2=-8$ subtract 10 and 2 to get 8 and give the answer a negative sign to get –8

Adding or Subtracting 3 or more Signed Numbers

If there are more then 2 signed numbers in one problem, one way to combine them all is to **combine them from left to right.** Combine the first two numbers and then combine that answer with the next number and continue until finished.

Example 1

$$8-12+1$$
$$=-4+1$$
$$=\mathbf{-3}$$

Example 2

$$-8+12-7+8$$
$$=4-7+8$$
$$=-3+8$$
$$=\mathbf{5}$$

Example 3

$$8-2-4-7$$
$$=6-4-7$$
$$=2-7$$
$$=\mathbf{-5}$$

Example 4

$$-3+5-4+6$$
$$=2-4+6$$
$$=-2+6$$
$$=\mathbf{4}$$

A second way to combine several numbers is to **combine all the positive numbers** by adding and getting a positive total, then **combine all the negative numbers** by adding and getting a negative total. **Then combine the positive total and the negative total** by subtracting and using the sign of the number farthest from zero.

Example 5

$$-8+2+4-6$$
$$=6-14$$
$$=\mathbf{-8}$$

Example 6

$$8-2+1-4$$
$$=9-6$$
$$=\mathbf{3}$$

Example 7

$$8-2-4-5$$
$$=8-11$$
$$=\mathbf{-3}$$

Example 8

$$3-2+4-7$$
$$=7-9$$
$$=\mathbf{-2}$$

Multiplying 3 or more Signed Numbers

If there are **three** signed numbers multiplied together, multiply the first two numbers together and then multiply that answer times the third number.

Example 9

$$3(2)(-4)$$
$$=6(-4)$$
$$=\mathbf{-24}$$

Example 10

$$-(-2)(-3)$$
$$=2(-3)$$
$$=\mathbf{-6}$$

Example 11

$$(-4)(-2)(5)$$
$$=(8)(5)$$
$$=\mathbf{40}$$

Example 12

$$(-2)(4)(3)$$
$$=(-8)(3)$$
$$=\mathbf{-24}$$

